

# Pediatric Surgery and Medicine for Hostile Environments

*Borden Institute  
Walter Reed Army Medical Center  
Washington, DC*

*Office of The Surgeon General  
United States Army  
Falls Church, Virginia*

*US Army Medical Department Center and School  
Fort Sam Houston, Texas*

*The test of the morality of a society  
is what it does for its children.*

—Dietrich Bonhoeffer (1906–1945)

This book is dedicated to the military medical professional in  
a land far from home, standing at the bedside of a critically ill  
child.

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## Foreword

Throughout American history, military physicians have provided humanitarian care to civilians whenever possible. This was especially the case during the period of westward expansion in the 1800s, when, in many instances, Army doctors stationed at remote outposts represented the sole source of medical care for pioneering families. Today, officers and enlisted soldier-medics are deployed to over a hundred nations in all corners of the world. For much of the populace of these countries, especially children, these uniformed combat medics, nurses, physicians, and allied health professionals represent the only hope for modern and compassionate medical and surgical care.

Now, more than ever before, large numbers of indigenous children with a wide range of acute and chronic medical conditions are presenting for treatment at US military medical facilities. Family members travel for days over rugged terrain, sometimes carrying children on their backs, in order to reach a US military facility, knowing that their children will receive life-saving and compassionate treatment there. During my many visits to US military facilities in Iraq and Afghanistan, while participating in reviews of clinical research programs in Africa and Asia, or engaged in humanitarian missions in developing nations, I find few images are as heart rending as those of severely injured, ill, and wounded children. It is an unfortunate but irrefutable fact that the most innocent and vulnerable members of a society, its children, are often the first to suffer from the turmoil of an increasingly violent and unpredictable world.

Recognizing this state of affairs, my predecessor directed that the experience in pediatric care garnered by our deployed medical officers be incorporated into this book, *Pediatric Surgery and Medicine for Hostile Environments*. This manual will serve as a basic reference for military physicians and surgeons whose usual scope of practice entails limited exposure to childhood illness. To accomplish this objective, some of the most talented

and experienced pediatricians and pediatric subspecialty surgeons throughout the active and retired ranks of the Medical Corps of the Army, Navy, and Air Force were enlisted as contributors. All are to be commended for an outstanding effort and remarkable final product. I feel this manual will contribute significantly to the success of the overall humanitarian mission of military medicine and will advance our collective efforts to mitigate the tragedy of violent conflict and, whenever possible, may prevent or arrest the spread of war.

Lieutenant General Eric B. Schoomaker, MD, PhD  
The Surgeon General  
US Army  
Commanding General  
US Army Medical Command

Washington, DC  
May 2010

## Prologue

Injuries to civilian populations are a tragic consequence of war. Unfortunately, the changing nature of warfare is resulting in a progressively higher proportion of civilian casualties. During World War I, civilians accounted for less than 20% of all deaths. In World War II, they made up 48% of all deaths. Civilians account for 80% of the war dead in more recent conflicts.<sup>1</sup> It is estimated that more than 2 million children perished as a result of war in the last decade of the 20th century, with over 6 million injured or permanently disabled.<sup>2</sup> The current US military conflicts, Operation Enduring Freedom (OEF) in Afghanistan and Operation Iraqi Freedom (OIF) in Iraq, have also resulted in a significant incidence of pediatric trauma.

The primary mission of the deployed military healthcare system is to “preserve the fighting strength” by caring for sick and injured US military and coalition forces. Another vital role is to provide humanitarian care for the civilian population. Local national admissions to level III facilities, such as combat support hospitals (CSHs), are supported by US military doctrine if the patient is suffering from an illness or injury that threatens life, limb, or eyesight. The Center for Army Strategic Studies reports pediatric patients comprise approximately 10% of all CSH admissions in Iraq and Afghanistan. Children comprised almost half of the humanitarian admissions in both theaters, and their length of hospital stay was roughly twice as long as that of all adult patients.<sup>3</sup> As of late 2009, it is estimated that between 5,000–6,000 children, many critically injured, have been admitted to deployed hospitals in Iraq and Afghanistan. Although nontraumatic and medical diagnoses were responsible for 25% of all pediatric admissions to CSHs, trauma injuries, of which 75% were penetrating, were the most common reasons for admission.<sup>4</sup> Traumatic injuries to children accounted for 12% of all occupied beds at CSHs, 11% of transfused and ventilated patients, and 13% of all combat hospital deaths.<sup>5</sup> Although the primary mechanisms of injury in children are gunshot wounds (39%), followed by explosive injuries (32%), there are distinct differences between theaters

(Tables 1 and 2, Figure 1).The length of hospital stay for these children averaged 7–15 days. On average, they each underwent more than two invasive or surgical procedures. The pediatric mortality rate has trended upward annually, and the overall mortality rate is 6.9% for children admitted to a CSH. This is significantly higher than for adults in both coalition and humanitarian emergency admissions, and more than double the reported pediatric civilian trauma mortality rate of 2.9%.<sup>6</sup>

Burns accounted for one third of inpatient deaths, followed by head injuries (75% of which were penetrating), at 25%. Infection and sepsis accounted for 10% of pediatric mortality, but when secondary infection was considered, it was evident that infections were a major factor in 30% of all pediatric CSH deaths. Head injuries resulted in the highest case fatality rates (20%), while pediatric burn injuries had a case fatality rate of 16% at the CSH. In contrast, the case fatality rate for all other diagnoses was 3.8%.

The scope of the pediatric mission is a compelling reason to refine predeployment and deployment education to improve

**Table 1. Causes of Pediatric Injury by Theater**

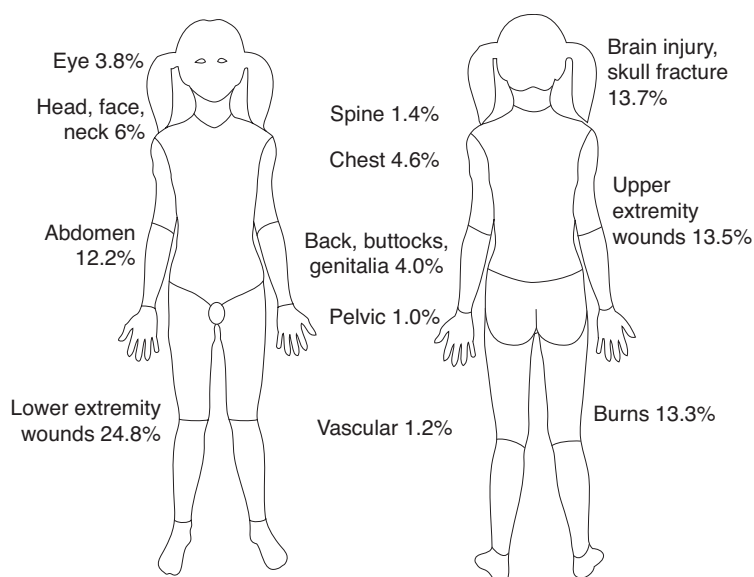
Known Cause of Injury (Pediatric Inpatients)	Percent of Total Injured in Afghanistan	Percent of Total Injured in Iraq
Gunshot wounds	21	56.6
Burns	14.6	5.8
Landmines	14.6	0.8
Motor vehicle crashes	12.5	6.8
Falls	12.3	1.5
Fragments	8.2	13.4
Blasts	7.4	8.7
Complications of previous injuries	4.8	4.7
Environmental (drowning, animal bites, cold, venomous bites/stings)	2.3	0.7
Poisoning	1.2	0.5
Stab wounds	1.1	0.3

**Table 2. Principal Pediatric Traumatic Diagnosis by Theater\***

<b>Principal Diagnosis (Pediatric Inpatients)</b>	<b>Percent of Those Injured in Afghanistan</b>	<b>Percent of Those Injured in Iraq</b>	<b>Percent of Total Injured<sup>†</sup></b>
Burns	16.3	10.1	13.3
Abdominal wound with bowel/organ injury, penetrating	9.4	14.4	11.8
Lower extremity wound, fracture, open	6.4	12.3	9.2
Lower extremity wound, penetrating	5.3	8.5	6.9
Skull fracture, open	6.4	7.1	6.7
Upper extremity wound, fracture, open	3.8	5.5	4.6
Lower extremity wound, fracture, other	5.3	2.7	4.0
Skull fracture, other	5.7	2.1	4.0
Eye injury	5.8	1.6	3.8
Back/buttock/genitalia wound, penetrating	2.2	5.3	3.7
Lower extremity wound, traumatic amputation	5.5	1.7	3.6
Upper extremity wound, penetrating	2.8	4.0	3.4
Face/head/neck wound, penetrating	3.7	2.5	3.1
Upper extremity wound, traumatic amputation	4.1	2	3.1
Head injury/traumatic brain injury	3.0	3.1	3.1
Chest wound, penetrating	1.8	3.5	2.6
Upper extremity wound, fracture, other	2.7	1.5	2.1
Chest wound, pneumothorax	0.9	1.7	1.3
Vascular injury	0.9	1.6	1.2
Face/head/orbit fracture, open	0.8	1.7	1.2
Face/head/orbit fracture, other	1.7	0.5	1.1
Lower extremity wound, other	1.3	0.7	1.0
All others	4.4	5.9	5.1
<b>Totals (average percent)</b>	<b>51.20</b>	<b>48.80</b>	<b>100.00</b>

\*Most common injuries grouped and sorted by theater.

<sup>†</sup>Total number injured in Afghanistan: 787; total number injured in Iraq: 750; total number injured overall: 1,537.



**Figure 1.** Distribution of injuries by anatomic region.

outcomes in this vulnerable population. This manual was created in recognition of the clear need for pediatric emergency and humanitarian care delivery by the US military healthcare system in Afghanistan and Iraq during OEF and OIF.

Our intention is to provide military physicians, often practicing in an austere environment, with a current and concise reference for the basic medical, surgical, and critical care of children. It should be used as a pragmatic reference but not as a substitute for published textbooks, current peer reviewed articles, or reasoned judgment. Operative procedures performed on children often entail significant risk even under ideal circumstances, and should not be attempted without a complete assessment of the available resources and equipment, experience of the operating room team, potential complications, nonoperative options, availability of follow-up care, and an honest overall assessment of the risk to the child from the procedure to be undertaken.

It is our ethical obligation to counsel the parent or guardian, if available, about the risks and benefits of a procedure, and to obtain their consent for nonemergent operations. Local custom and the family's desires must be respected in all cases, lest what was intended to be a humanitarian gesture results in unintended consequences that negatively impact the success of the overall military mission.

In many situations, the extent to which such aid can be rendered will be limited by operational considerations, lack of age-appropriate equipment and supplies, and limitation of other resources.

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## Introduction

### **Caring for Children in War: Military Humanitarianism and Fourth-Dimension Warfare**

Caring for children injured in combat or stricken ill by the consequences of war has long been a priority for American military medical forces. But the potential impact of “military humanitarianism” on the outcome of war is only now being recognized as a key component of the National Military Strategy, which encourages American military forces to promote peace and stability worldwide to “shape the world, not merely to be shaped by it.”<sup>1</sup>

Experts on modern warfare say that it has entered a “fourth” dimension. The first two dimensions encompassed war’s breadth and depth, but were limited by time and space. The third dimension began with the advent of airpower, which reached across the boundaries of distance and represented one of the major revolutions in warfare. Technology and the digital transformation have been referred to as warfare’s fourth dimension because the speed of information exchange allows for one warring faction to interrupt its enemy’s information–decision–action (IDA) cycle.<sup>2</sup> However, this view of warfare’s fourth dimension is too shortsighted.

The ancient Greeks had different concepts of time. The idea of time as “chronos” defines physical time measured in a linear fashion, in which each moment is like the next. “Kairos” reflects the perfect season or quintessential moment that must be seized and acted upon to achieve a desired result. Physicians caring for children in austere or hostile environments are able to interrupt the enemy’s IDA cycle by affecting kairos time in the families and communities for which they provide care. They can be with the family at the exact moment of need, and can affect the family’s perspective for a lifetime. This is how military humanitarianism, particularly the care of children in wartime and in complex humanitarian disasters, embodies the fourth dimension of warfare.

The impact of humanitarianism at these quintessential kairos moments can be seen throughout our history. The Lewis and Clark expedition, commissioned by President Jefferson, was the longest infantry patrol in US history. It traveled 8,000 miles in 28 months, and military humanitarianism was one of the key goals of the mission.<sup>3</sup> Lewis and Clark acknowledged their mission's success was in a large part due to the skill and leadership of their pregnant Shoshone guide, Sacagawea. Her knowledge of the geography and the languages and cultures of the tribes she encountered saved them on many occasions. When Sacagawea's labor failed to progress, Lewis cared for her and administered two rings of a rattlesnake rattle, according to a local American Indian folk medicine tradition. Sacagawea's child fell ill when he was 15 months old. On May 22, 1806, Lewis wrote, "The child . . . is very ill this evening . . . he was attacked with a high fever . . . and his neck and his throat are much swollen." After treatment with cream of tartar and repeated application of poultice of onions, the fever broke.<sup>4</sup> The attentive care with which Lewis and Clark ministered to Sacagawea during her labor and to her son during his life-threatening illness was the kairos that won them her heart and her loyalty.<sup>5</sup>

After the United States dropped a nuclear bomb on Hiroshima in 1945, a Japanese physician, Dr Hachiya Michihiko, was positively affected by US military doctors who helped him treat Japanese civilians wounded and sickened by the bomb. He wrote,

They gave us great help, materially and spiritually, in the reconstruction of our hospital. Two doctors removed fear and hostility from our hearts and left us with a bright, new hope. The harsh winter that followed the autumn was less harsh for their having come.<sup>6</sup>

Military humanitarianism has also played a critical role in current conflicts. US Special Forces, focusing on engineering projects and delivering healthcare, helped radically improve the security on Basilan Island, Philippines. Over 4 years, this

“volatile, uncertain, complex and ambiguous” situation was made more secure by allowing the Philippine military to reduce its presence from 15 battalions to 2.<sup>7,8</sup> The impact medical care had on young mothers and children—and, by association, future security—there remains to be seen.

In Afghanistan, humanitarian efforts may play an even greater role. In 2004, one in four children died before age 5, and one in twelve women died in childbirth. Afghanistan had been a training ground for enemies of the United States, and was far from becoming a developed nation. While talk in Iraq was about rebuilding, in Afghanistan, our efforts continue to be building from the ground up, and military physicians are deeply involved in this process. Caring for children is at the forefront of these efforts in military hospitals and in building host-nation capabilities.<sup>9–11</sup>

Although the nuances of fourth-dimension warfare are complex, the realities for doctors and nurses are much simpler. Service members caring for children in Iraq, Afghanistan, the Horn of Africa, the Philippines, Somalia, East Timor, and many other places around the globe focus their energies on building up nations’ healthcare systems so that infants there have the same chance at survival as infants born in the United States. If our enemies are indeed finite, it is possible to diminish their number by taking away their ability to recruit from the children of the next generation. For example, consider a child whose first memories of Americans are the faces of the doctors and nurses in uniform who struggle to save her after she stepped on a mine. What will this child and her parents think of the Americans they have met? Will their memories make them less likely to become our enemies? This is fourth-generation kairos warfare.<sup>12</sup>

In his address to the House of Commons on June 8, 1982, President Ronald Reagan said, “The ultimate determinant in the struggle that’s now going on in the world will not be bombs and rockets, but a test of wills and ideas, a trial of spiritual resolve, the values we hold, the beliefs we cherish, the ideas to which

we are dedicated.”<sup>13</sup> This book is directed at those engaged in this fight, and dedicated to everyone standing at the bedside of a critically ill child in a land far from home.

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